

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (Once Amended) A computer-implemented method of mirroring a component of a three-dimensional object modeled in a computer-simulated three-dimensional modeling space, the method comprising:
- receiving data to select a first component of the three-dimensional object;
- automatically analyzing a plurality of candidate orientations to select a preferred orientation for creation of a reproduction of the first component; and
- creating a new component of the three-dimensional object that is ~~a the reproduction in the preferred orientation~~ of the first component in the preferred orientation, the new component being created based on a position of the first component with respect to a surface, said surface comprising a plane of symmetry positioned in the three-dimensional modeling space and wherein said surface is not a component of the three-dimensional object.
2. (Original) A computer-readable data storage apparatus comprising instructions for configuring a computer system to perform the method of claim 1.
3. (Original) The method of claim 1 further comprising receiving input from a user to position the surface in the three-dimensional modeling space.
4. (Original) The method of claim 1 wherein:

the surface comprises a plane logically separating the modeling space into a first and a second section; and

the first component is positioned in the first section of the modeling space; and

creating the new component comprises creating the new component in the second section.

5. (original) The method of claim 4 wherein:

the first component comprises a first plurality of vertices; and

creating the new component comprises determining a second plurality of vertices, each vertex in the second plurality corresponding to a vertex in the first plurality, and each vertex in the second plurality being determined based on a position of said corresponding vertex with respect to the plane.

6. (original) The method of claim 4 wherein creating comprises creating such that the first and the new component are in symmetrical positions with respect to the plane.

7. (Once Amended) The method of claim 1 further comprising:

applying a plurality of transformations to the first component to determine the plurality of candidate orientations; and

selecting one of a plurality of procedures for constructing the new component, the plurality of procedures comprising a truly mirrored copy procedure and a copy procedure, the copy procedure ~~comprising~~ utilizing one of the plurality of transformations.

8. (original) The method of claim 1 wherein:

the first component comprises a plurality of first sub-components; and

creating the new component comprises creating a plurality of new sub-components, each of the new sub-components corresponding to one of the first sub-components.

9. (Once Amended) The method of claim 8 further comprising:

applying a plurality of transformations to each of the first sub-components to determine the plurality of candidate orientations of each corresponding new sub-component; and analyzing each of the candidate orientations of each of the new sub-components to determine existence of a candidate orientations meeting a predetermined selection criteria indicative of a preferred transformation.

10. (Once Amended) The method of claim 9~~8~~ further comprising:

based on said predetermined selection criteria, determining ones of the new sub-components that are to be created as truly mirrored sub-components and ones of the new sub-components to be created as replicated components.

11. (Once Amended) The method of claim 10 further comprising generating a bill of materials wherein:

for each of the first sub-components that is reproduced as a truly mirrored sub-component, said first sub-components and said truly mirrored sub-components are represented in the bill of materials as different line items; and
for each of the first sub-components that is reproduced as a replicated sub-component, said ~~each~~ first sub-components and said replicated sub-components are represented in the bill of materials as instances of the same line item.

12. (Once Amended) A computer-implemented method for generating components of an object modeled in a three-dimensional modeling space provided by a computer aided design system, the method comprising:

positioning a plane in the three-dimensional modeling space to logically subdivide the modeling space into a first division comprising a first component and a second division in which a reproduction of the first component is to be located and to define a reference geometry for creation of the reproduction of the first component, wherein said plane is not a component of the object modeled in the three-dimensional modeling space;

computing a plurality of geometrically transformed components by applying a plurality of different transformations to the first component, each transformed component comprising a different orientation of the first component; and
constructing the reproduction of the first component based on one of the plurality of geometrically transformed components such that the first component and the reproduction are symmetrical to each other with respect to the plane.

13. (original) A computer-readable data storage apparatus comprising instructions for configuring a computer system to perform the method of claim 12.

14. (original) The method of claim 12 wherein constructing the reproduction comprises:
determining a preferred geometric transformation of the first component for use in constructing the reproduction by comparing locations of geometric features of the transformed components.

15. (Once Amended) The method of claim 14 wherein:
the first component comprises a plurality of sub-components;
computing the plurality of geometrically transformed components comprises, for each one of the plurality of sub-components, applying a plurality of transformations to said each one of the plurality of sub-components; and
determining a preferred geometric transformation comprises determining for each one of the plurality of sub-components a manner in which to construct a corresponding reproduction.

~~17-16.~~ (Once Amended) The method of claim 15 wherein the manner in which to construct the corresponding reproduction is selected from the group consisting of generating a truly mirrored component and generating a replicated component.

~~18-17.~~ (Once Amended) The method of claim ~~17-16~~ further comprising generating a bill of materials comprising a plurality of line items, the bill of materials being generated such that:
a first one of the first plurality of sub-components and a corresponding truly mirrored component are represented as different line items; and
a second one of the first plurality of sub-components and a corresponding replicated component are represented by different instances of the same line item.

~~19-18.~~ (Once Amended) The method of claim 14 wherein:

the first component comprises a first plurality of vertices;
comparing locations of geometric features comprises comparing locations of vertices;
comparing locations of vertices comprises:

computing a plurality of mirrored vertices, each mirrored vertex corresponding to one of the first plurality of vertices, such that each mirrored vertex and said corresponding one of the first plurality of vertices are equidistant to the plane and positioned on different sides of the plane; and

for each one of the transformed components, computing an acceptance value based on a difference between locations of vertices of the transformed component and locations of the plurality of mirrored vertices, the acceptance value indicative of a preferred transformation.

~~20-19.~~ (Once Amended) The method of claim ~~19-18~~ wherein the acceptance value is a standard deviation value and the method further comprises determining a preferred geometric transformation by comparing the standard deviation value for each of the transformed components to a predetermined criteria indicative of a preferred transformation.

~~21-20.~~ (Once Amended) The method of claim 12 wherein:

each one of the plurality of different transformations comprises a transformation positioning a principal axes and a centroid of the first component at a position in the second division of the modeling space on the second side of the plane and is symmetric to the position of a principal axes and centroid of the first component.

~~22.~~ 21. (Once Amended) The method of claim 12 further comprising:

storing a data structure associating the first component and the reproduction; and
initiating an update of the reproduction in response to a change in the structure of the first component.

~~23.~~ 22. (Once Amended) The method of claim 15 further comprising:

logically integrating the reproduction into the modeled object such that the modeled object comprises both the first component and the reproduction; and
storing a data structure to establish a mating relationship between the corresponding reproduction of a first one of the plurality of sub-components and the corresponding reproduction of a second one of the plurality of sub-components, said data structure comprising data to initiate a corresponding positional transformation of the corresponding reproduction of the first one of the plurality of sub-components in response to a positional transformation of the corresponding reproduction of the second one of the plurality of sub-components.

~~24.~~ 23. (Once Amended) The method of claim ~~23~~ 22 wherein:

the mating relationship comprises a type selected from a group consisting of parallel, angle, coincident, concentric, distance, perpendicular, and tangent.

~~25.~~ 24 (Once Amended) The method of claim ~~23~~ 22 further comprising:

automatically creating the mating relationship to mate a geometric feature of the corresponding reproduction of the first one of the plurality of sub-components with a corresponding geometric feature of the corresponding reproduction of the second one of the plurality of sub-components.

~~26.~~ 25. (Once Amended) A computer-aided design system for processing data representing construction of a three-dimensional object, the system comprising:

a processing unit coupled to a program storage medium, the program storage medium comprising instructions to configure the processor to:

calculate a plurality of orientations for a first component with respect to a plane of symmetry, wherein said plane of symmetry is not a component of the constructed three-dimensional object, each one of the plurality of orientations comprised of a plurality of vertices;
calculate a plurality of reflected vertices for the first component;
compute a plurality of standard deviation values, one deviation value computed for the plurality of vertices of each one of the plurality of orientations and the plurality of reflected vertices; and
construct a first reproduction of the first component in a manner determined by the plurality of deviation values.

27. ~~26.~~ (Once Amended) The system of claim ~~26-25~~, wherein the program storage medium further comprises instructions to configure the processor to:

compute one of the plurality of deviation amounts equal to a result considered zero; and
construct the first reproduction by replicating the first component.

28. ~~27.~~ (Once Amended) The system of claim ~~26-25~~ wherein the program storage medium further comprises instructions to configure the processor to:

compute the plurality of deviation amounts equal to a result considered non-zero; and
construct the first reproduction by reflecting the first component.

29. ~~28.~~ (Once Amended) The system of claim ~~26-25~~ wherein the instructions to configure the processor to calculate the plurality of orientations for the first component comprises instructions to:

construct a plurality of transformations; and
apply each one of the plurality of transformations to a plurality of geometric features of the first component.

30. ~~29.~~ (Once Amended) The system of claim ~~26-25~~ wherein the program storage medium further comprises instructions to configure the processor to:

build a hierarchical data structure comprising a hierarchical relationship between the first component and a second component;
construct a second reproduction, the second reproduction symmetrically positioned with respect to the second component and the plane;
include the first reproduction and the second reproduction in the hierarchical data structure;
and
establish the hierarchical relationship between the first reproduction and the second reproduction.

31-30. (Once Amended) The system of claim **26-25** wherein the program storage medium further comprises instructions to configure the processor to:

create a mating relationship between the first reproduction and a second reproduction corresponding to a second component.

32-31. (Once Amended) The system of claim **31-30** wherein the program storage medium further comprises instructions to configure the processor to:

determine a first geometric entity belonging to the first reproduction, the first geometric entity similarly positioned to a reflected first mated geometric entity belonging to the first component;
determine a second geometric entity belonging to the second reproduction, the second geometric entity similarly positioned to a reflected second mated geometric entity belonging to the second component; and
define the mating relationship using the first geometric entity and the second geometric entity.